Book Reviews

The Borane, Carborane, Carbocation Continuum. Edited by Joseph Casanova. Wiley Press: New York. 1998. 437 pp. $89.95. ISBN 0-417-18075-0.

Students of the chemical sciences have often pondered the isoelectronic nature of carbocations and boranes. The present work illuminates this obvious homology and the structural consequences of their shared electron deficiency in a scholarly fashion and sews together the contributions of eminent workers in the fields of carbocations and borane structures. Several entertaining and informative introductory monologues, from Norman Greenwood and Nobel laureate William Lipscomb to the editor himself, serve to warm the general reader to the subject. Chapter contributors include many representatives from the Lokar Hydrocarbon Research Institute at the University of Southern California, where a landmark symposium that laid a basis for the book took place in 1995 in honor of Robert E. Williams, a pioneer in the field of carborane chemistry.

The book is divided into four parts, totaling 18 chapters. The book progresses forward logically from a largely theoretical discussion of "Structure in Boranes and Carboranes" (Part I). Contributors here include Robert Williams himself, with a chapter entitled "Vertex Homogeneity: The 'Hidden Hand' that Governs Electron Deficient Borane, Carborane, and Carbocation Structures". Part II, the "Carborane−Carbocation Continuum", begins with Chapter 5 from George Olah ("Boron Superelectrophiles and Their Carbocation Analogs"), which is concise and very interesting. Those whose appetite is whetted for a more carbon-based discussion should refer to his seminal works "Hypercarbon Chemistry" and "Superacids" for more detailed descriptions of carbocation structure and reactivity. Chapter 6, "Extension of the Borane Carbocation Continuum to Cage Systems", is noteworthy to the interdisciplinary reader. Here the authors illustrate some remarkable analogies between borane and carbocation structure for complex systems and then proceed to compare known carbocations with computationally derived borane structures. The discussion by Schleyer and Najafian in Chapter 7 on the possible aromaticity of polyhedral boranes, carboranes, and carbocations is also very insightful. For example, the authors conclude that not only are many *closo*-borane dianions ($B_nH_n^{2-}$) aromatic, but also the extent of aromatic stabilization becomes proportionally greater as cluster size increases, in contrast to carbon-based aromatic species.

Part III, "Untangling Molecular Structures", concerns the computational prediction and elucidation of molecular structures. In Chapter 9, Bausch and Tebben employ ab initio methods to predict the structures of *nido*-$C_4B_7H_{11}$ carboranes and *nido*-8-vertex carboranes. In Chapter 10, Onak reviews the use of IGLO calculations to predict ^{13}C chemical shifts of carboranes. Chapter 12 elucidates the use of ab initio theory to gain insights into the reactions of boranes with hydrocarbons. In Chapter 13, Grimes leads a nice discussion of metalocarborane sandwich chemistry.

Part IV is entitled "New Species of Boranes and Carboranes", and the last five chapters contained therein are a fitting way to close the book. In Chapter 14, Fehlner compares boranes to various hydrocarbon metal complexes, and in Chapter 17, the discussion centers around clusters with B_4 and NB_3 skeletons. The final chapter is entitled "New Perspectives in the Chemistry of C_2B_4- and C_4B_8-Carboranes" and concerns new reactivity of carboranes with an emphasis on metalations. It should be mentioned that the other chapters not explicitly cited here are every bit as noteworthy. The book is weighted toward boranes and carboranes (14 chapters) as opposed to carbocations, which make a substantive appearance in 4 of 18 total chapters. Nevertheless, for students of borane and carborane chemistry, this insightful book represents a very worthwhile addition to their collections.

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Principles of Chemical and Biological Sensors. Vol. 150. Chemical Analysis: A Series of Monographs on Analytical Chemistry and Its Applications. By Dermot Diamond (Dublin City University, Dublin, Ireland). John Wiley & Sons, Inc.: New York. 1998. xxvii + 334 pp. $89.00. ISBN 0-471-54619-4.

The field of chemical and biological sensors is interdisciplinary in nature and attracts the attention of researchers from broad scientific areas, including chemistry, biology, and engineering. There is a clear need for a book that would outline the fundamentals and technical aspects of chemical and biological sensors in a clear fashion. Such a book will increase the knowledge and understanding of this wide field and may facilitate the collaboration between researchers of various disciplines that is required in order to produce a commercially viable sensor.

Principals of Chemical and Biological Sensors describes the contributions of several researchers that are based in Dublin, Ireland, to the field of chemical and biological sensors. The book is written in a clear and easy-to-read language, and no extensive background in chemistry, biology, or engineering is required in order to understand the text. A variety of fundamental issues and applications of chemical and biological sensors are addressed in the book. A short overview of chemical and biological sensors is given in chapter 1. Chapter 2 discusses clearly and in detail the theory of ion selective electrodes (ISE), types of ISEs, the characteristics of ISEs, and their application in various areas. Chapter 3 describes the theory and practice of amperometry and gives an interesting description of microelectrodes. Chapter 4 focuses on the use of macromolecules such as enzymes, antibodies, and DNA molecules in chemical and biological sensors. These chapters give a very good description of the fundamental aspects of electrochemical biosensors and biomaterials. Chapters 5 and 6 describe, in short, new and exciting developments in the areas of optical chemical sensors and miniaturized chemical sensors. While titled "Sensor Signal Processing", chapter 7 gives a general description of signal processing methods of analog and digital signals along with practical guidelines for the design of digital filters.

As mentioned by the author in the book's preface, it is impossible to fully cover the field of chemical and biological sensors in a book of manageable size. However, the restriction of coverage based on geographical location is an apparent weakness of the book. Many important recent developments in the field are mentioned only briefly as a result of this restriction. For example, glucose sensing, which is the most successful demonstration of the commercial viability of biosensor technology, is not covered in the book. DNA-based biosensors, which may be the next wave of mass-produced biosensors, are only briefly discussed. Additionally, citation of references in the book is somewhat inconsistent. While chapters 2, 4, and 5 point to specific references, chapters 3, 6, and 7 only give a list of suggested further readings.

In conclusion, while the book gives an incomplete description of the field of chemical and biological sensors, the chosen topics are very informative and covered in a clear way. The book is recommended as a good source of information for analytical chemists, biochemists, chemical engineers, and other scientists who are interested in the emerging technology of chemical sensors and biosensors.

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